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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

OIPE IAP97 SEP 08 2008 PATENT & TRADEMARK OFFICE

APPEAL BRIEF FOR THE APPELLANT

Ex parte Theodoros SALONDIS et al.

DISTRIBUTED BANDWIDTH ALLOCATION AND TRANSMISSION COORDINATION METHOD FOR QUALITY OF SERVICE PROVISION IN WIRELESS AD HOC NETWORKS

Serial No. 10/736,909
Appeal No.:
Group Art Unit: 2616

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Atty. Docket: 058501.00046

KMM/skl

Encls: Check No. 019559
Appeal Brief

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Appellant:

Theodoros SALONIDIS et al. Appeal No.:

Serial Number: 10/736,909 Group Art Unit: 2616

Filed: December 17, 2003 Examiner: Jutai KAO

For: DISTRIBUTED BANDWIDTH ALLOCATION AND TRANSMISSION COORDINATION METHOD FOR QUALITY OF SERVICE PROVISION IN WIRELESS AD HOC NETWORKS

BRIEF ON APPEAL

September 8, 2008

This is an appeal from the final rejection set forth in an Official Action dated January 8, 2008, finally rejecting claims 1-8, all of the claims pending in this application: (1) as being unpatentable over Kondylis et al. (U.S. Patent 6,621,805) (herein "Kondylis"), in view of Cousins (U.S. Patent 6,618,385) (herein "Cousins"), and further in view of Galand et al. (U.S. Patent No. 6,628,670) (herein "Galand"); (2) as being unpatentable over Kondylis, in view of Cousins, in view of Galand, and further in view of Counterman (U.S. Patent No. 6,724,727) (herein "Counterman"); or (3) as being directed to non-statutory subject matter. A Request for Reconsideration was timely filed on July 8, 2008. An Advisory Action was issued on July 28, 2008, indicating that the response of July 8, 2008, did not place the application into condition for allowance. Therefore, claims 1-8 remain rejected. A Notice of Appeal was timely filed on July 8, 2008 with a petition for Extension of Time. This Appeal Brief is being timely filed.

I. REAL PARTY IN INTEREST

The real party in interest in this application is the University of Maryland of College Park, Maryland, by virtue of an Assignment by the inventors, which assignment was recorded at Reel 015276, Frame 0036, on April 28, 2004.

II. RELATED APPEALS AND INTERFERENCES

There are no known related appeals and/or interferences which will directly effect or be directly effected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-8, all of the claims pending in the present application, are the subject of this appeal. Claims 1-2 and 4-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kondylis, in view of Cousins, and further in view of Galand. Claim 3 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kondylis, in view of Cousins, in view of Galand, and further in view of Counterman. Claim 7 was rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

IV. STATUS OF AMENDMENTS

All of claims 1-8 stand as they were previously presented prior to the Final Office Action. No amendments were made after the final rejection. Thus, claims 1-8 are pending and their respective rejections of claims 1-8 are appealed. A response was filed

on July 8, 2008, and was entered, but the response did not include any amendments to the claims.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1, upon which claims 2-5 are dependent, recites a method of allocating bandwidth in a first node that is operable in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. (Specification, at least on page 25, lines 16-20; Fig. 8 ("representative method 800")). The method includes the steps of initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link (Specification, at least on page 25, lines 20-23; Fig. 8 ("step 810")), and determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. (Specification, at least on page 25, lines 23-25; Fig. 8 ("step 820")). The method further includes the steps of communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow (Specification, at least on page 25, lines 25-27; Fig. 8 ("step 830")), and notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. (Specification, at least on page 25, lines 27-29; Fig. 8 ("step 840")). The method further includes the step of adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed. (Specification, at least on page 25, line 29 – page 26, line 1; Fig. 8 ("step 850")).

Claim 6 recites a network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation.

(Specification, at least on page 26, lines 15-17; Fig. 9 ("representative network device 900"); ("ad hoc wireless network 910")). The network device includes a first communication unit configured to initiate a communication between the device and a node in the network that, together, are endpoints of a link in the network, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link. (Specification, at least on page 26, lines 18-22; Fig. 9 ("first communication unit 930"), ("representative network device 900"), ("node 905"), ("network 910"), ("flow sharing link 915")). The network device further includes a first processing unit configured to determine a first new bandwidth allocation that approaches a first optimization condition for the flow, wherein the first processing unit is operably connected to the first communication unit. (Specification, at least on page 26, lines 22-25; Fig. 9 ("first processing unit 950"), ("flow sharing link 915"), ("first communication unit 930")). The network device further includes a second communication unit configured to communicate with the node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, wherein the second communication unit is operably connected to the first communication unit. (Specification, at least on page 26, lines 25-29; Fig. 9 ("second communication unit 940"), ("node 905"), ("first communication unit 930")). The network device further includes a third communication unit configured to notify neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed, wherein the third communication unit is operably connected to the first communication unit. (Specification, at least on page 26, line 29 – page 27, line 4; Fig. 9 ("third communication unit 920"), ("network 910"), ("first communication unit 930")). The network device further includes a second processing unit configured to adopt the

mutually-agreed upon optimal allocation for the flow when reallocation is needed, wherein the second processing unit is operably connected to the first communication unit. (Specification, at least on page 27, lines 4-7; Fig. 9 ("second processing unit 960"), ("first communication unit 930")).

Claim 7 recites a computer program embodied on a computer readable medium to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. (Specification, at least on page 27, lines 8-13; Fig. 10 ("flowchart 1000")). The computer program is configured to control a processor to perform a first sub-routine for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link. (Specification, at least on page 27, lines 13-17; Fig. 10 ("first sub-routine 1010")), and a second sub-routine for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. (Specification, at least on page 27, lines 17-19; Fig. 10 ("second sub-routine 1020")). The computer program is configured to control the processor to perform a third sub-routine for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow (Specification, at least on page 27, lines 19-21; Fig. 10 ("third sub-routine 1030")), and a fourth sub-routine for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. (Specification, at least on page 27, lines 21-23; Fig. 10 ("fourth sub-routine 1040")). The computer program is configured to control the processor to perform a fifth sub-routine for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed.

(Specification, at least on page 27, lines 24-26; Fig. 10 ("fifth sub-routine 1050")).

Claim 8 recites a network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. (Specification, at least on page 26, lines 15-17; Fig. 9 ("representative network device 900"), ("ad hoc wireless network 910")). The network device includes initiation means for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link. (Specification, at least on page 26, lines 18-22; Fig. 9 ("first communication unit 930"), ("representative network device 900"), ("node 905"), ("network 910"), ("flow sharing link 915")). The network device further includes determination means for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. (Specification, at least on page 26, lines 22-25; Fig. 9 ("first processing unit 950"), ("flow sharing link 915")). The network device further includes determination means for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow. (Specification, at least on page 26, lines 25-29; Fig. 9 ("second communication unit 940"), ("node 905")). The network device further includes notification means for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. (Specification, at least on page 26, line 29 – page 27, line 4; Fig. 9 ("third communication unit 920")). The network device further includes adoption means for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed. (Specification, at least on page 27, lines 4-7; Fig. 9, ("second processing unit 960")).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are the rejection of claims 1-2 and 4-8 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kondylis, in view of Cousins, and further in view of Galand, the rejection of claim 3 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kondylis, in view of Cousins, in view of Galand, and further in view of Counterman, and the rejection of claim 7 under 35 U.S.C. § 101, as allegedly being directed toward non-statutory subject matter. As will be discussed below, these rejections are in error, and claims 1-8 should all be found to meet the U.S. requirements for patentability under 35 U.S.C. § 101, § 102, and § 103.

VII. ARGUMENT

Appellants respectfully submit that each of the pending claims 1-8 recites patentable subject matter that is not taught, disclosed, or suggested by the cited art. Each of the claims is being argued separately, and thus, each of the claims stands or falls alone.

A. Claims 1-2 and 4-8 are not obvious in view of Kondylis, Cousins, and Galand

In the Final Office Action, claims 1-2 and 4-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kondylis, Cousins, and Galand. Appellants submit that each of claims 1-2 and 4-8 recite subject matter that is not obvious in light of Kondylis, Cousins, and Galand, and as such, the Board's reversal of the rejection is respectfully requested.

1) Claim 1

Claim 1 recites a method of allocating bandwidth in a first node that is operable in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The method includes the steps of initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link, and determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. The method further includes the steps of communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, and notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. The method further includes the step of adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed.

Appellants respectfully submit that Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, all of the elements of claim 1.

Kondylis generally describes a real-time multicast scheduler to avoid packet collisions and to facilitate color re-use, where "color" is defined as a channel selected as a combination of time-division multiple access, frequency-division multiple access, and code division multiple access schemes. (See Kondylis at Abstract).

Cousins generally describes a network initialization process to determine the maximum available data transfer throughput, optimized bandwidth, and optimized transfer conditions in a wired network. (See Cousins at col. 3, lines 42-58). Specifically,

the network initialization process also negotiates the number of twisted pair wires to use, detects and identifies scrambled wires, determines the compression scheme to use, etc. These parameters are then utilized in a predetermined well known modulation communications technique such as spread spectrum or Quadrature Amplitude Modulation (QAM) to accordingly adjust the data transfer rate between the two devices. Also, the negotiation session of Cousins seeks to establish the data transfer scheme between the two machines (e.g., how data is transferred over various twisted pair wires) and to determine the best use of the available bandwidth. Accordingly, part of this negotiation includes the selection of compression algorithms for use in the data transfer. Moreover, the negotiation further includes reservation of part of the bandwidth for isochronous data and/or other non-LAN uses such as streaming video. (See Cousins at col. 7, lines 40-52).

Galand generally describes routing path selection and bandwidth reservation to connections sharing a path in a packet switched wireline communication network. (See Galand at Abstract). Galand further provides exchanging of information (109) between the origin (access) node (100), the transit nodes (107) on the path, and the destination node (108). A Bandwidth Reservation (104) replies from transit nodes and end node generate either a call acceptance or a call reject (110). A Link Metric Update process (105) updates, in case of call acceptance, the modified link metrics. This information (111) is sent through the Control Spanning Tree to the Topology Database of each node in the network by means of a broadcast algorithm. (See Galand at col. 10, line 40 – col. 11, line 2).

The Final Office Action took the position that Kondylis discloses all the elements

of claim 1, with the exception of "initiating a communication between the first node and a second node in the network that, together, are end points of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link," "determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow," "communication with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow," "notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed," and "adopting the mutually-agreed upon optimal allocation for the flow when the reallocation is needed." The Final Office Action then cited Cousins and Galand as allegedly curing the deficiencies of Kondylis. (See Final Office Action at pages 4, 6, 10, and 15). Appellants respectfully submit that the rejection is erroneous for at least the following reasons.

As will be discussed below in greater detail, Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, at least, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," "*initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*," and "*notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed*," as recited in claim 1. Furthermore, Appellants respectfully submit that if the Board finds that the combination of Kondylis, Cousins, and Galand, fails to disclose, or suggest, <u>any one</u> of the aforementioned elements, the Board should

reverse the rejection, as the Final Office Action has failed to establish that claim 1 would be obvious to one of ordinary skill in the art, in light of the clear differences of claim 1 and the combination of Kondylis, Cousins, and Galand.

Furthermore, even assuming *arguendo* that the combination of Kondylis, Cousins, and Galand disclosed all the elements of claim 1, Appellants submit that one of ordinary skill in the art would not be motivated to combine the references of Kondylis, Cousins, and Galand, for at least the reasons discussed below. Accordingly, Appellants respectfully submit that the Final Office Action has failed to establish a prima facie case of obviousness, as claim 1 would not have been obvious to one of ordinary skill of the art, at the time the invention was made, in light of the cited references of Kondylis, Cousins, and Galand.

a) "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*"

The Final Office Action took the position that Kondylis discloses "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," as recited in claim 1, because Kondylis discloses that "the communication nodes can adapt the reserved bandwidth according to traffic fluctuation," and the Final Office Action interpreted "*configured to support at least one guaranteed feasible flow allocation*," as recited in claim 1, to read on the adaptation disclosed in Kondylis. (See Final Office Action at page 6). The Final Office Action attempted to support its conclusion that the limitation "*configured to support at least one guaranteed feasible flow allocation*," as

recited in claim 1, read on the adaptation disclosed in Kondylis, by interpreting "*flow allocation*" as reading on the reserved bandwidth disclosed in Kondylis, and arguing that "since bandwidth is reserved, it is guaranteed feasible." (See Final Office Action at page 2). Appellants respectfully submit that the Final Office Action's interpretation of "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," is clearly unreasonable, in light of the specification of the present application.

According to U.S. patent law, and the Manual of Patent Examining Procedure ("MPEP"), a U.S. patent examiner may only give a claim term "[its] broadest reasonable interpretation <u>consistent with the specification</u>." *Phillips v. AWH Corp.*, 415 F.3d 1303, 75 USPQ2d 1321 (Fed. Cir. 2005); *see also* Manual of Patent Examining Procedure, Section 2111 – Claims Interpretation; Broadest Reasonable Interpretation. Appellants respectfully submit that the Final Office Action's interpretation of "*flow allocation*" and "*feasible*," is not reasonable, given the specification, because the Office Action's interpretation of "*flow allocation*" and "*feasibility*" is not consistent with the respective definitions in the specification of the present application.

In defining "*feasibility*", the specification makes clear that a flow bandwidth allocation is not equivalent to a bandwidth that has already been reserved. Instead, the specification clearly indicates that flow bandwidth allocations that are feasible (and can later be reserved) are only those for which there exists a schedule that can realize them by taking into account interference relationships in the ad hoc network. For example, under the heading "***Rate feasibility***," the specification describes that embodiments of the invention may use a fluid model to describe the feasibility of bandwidth allocations in a

multi-channel ad hoc network. According to the fluid model, the rate (normalized bandwidth) r_f of a link flow f in an ad hoc network is the fraction of conflict-free slots allocated to flow f in a T-periodic schedule. Furthermore, according to the fluid model, a bandwidth allocation of flows $R = (r1, \ldots, r_f, \ldots r_{F1})$ is called feasible if there exists a conflict-free schedule that allocates to every flow f, a rate equal to r_f. (See Specification at paragraph 0062-0063).

This definition of feasibility and the feasibility conditions discussed in the specification allow embodiments of the invention to capture the interference relationships in wireless networks and also allow embodiments of the invention to realize both QoS objectives where the flow bandwidth allocations are known in advance (e.g. real-time traffic) and fairness objectives when the flow bandwidth allocations are not known in advance.

Kondylis merely addresses adapting a reserved bandwidth according to multicast real-time traffic. Specifically, Kondylis discloses that nodes can continuously estimate a current mean source rate and adapt an amount of reserved bandwidth accordingly. (See Kondylis at col. 6, lines 59-62). Thus, the teaching of Kondylis is limited to the scenario where the bandwidth allocations have already been reserved, and there is no disclosure, or suggestion, of taking into account interference relationships in the ad hoc network to determine bandwidth allocations which have not already been reserved.

In response to these arguments, which were presented in the Request for Reconsideration of July 8, 2008, the Advisory Action took the position that the specification of the present application does not limit the "feasible flow allocation" to be only that of a "conflict-free schedule" using the "T-periodic schedule," that the cited

passage in the specification is only an illustrative example used to describe the feasibility of bandwidth allocation, and that the claim language itself also does not limit the definition of the rate feasibility to that of the fluid model. (See Advisory Action at Continuation, page 2).

Appellants respectfully submit that the Advisory Action has missed the point of Appellants' arguments. Appellants do not argue that the definition of "*feasible*" is limited to the fluid model example disclosed in the specification of the present application. Instead, Appellants argue that the term "*feasible flow allocation*," as recited in claim 1 cannot be interpreted so broadly to read on a bandwidth that is merely reserved, in light of the specification's clear definition of "*feasible flow allocation*". Kondylis does not use the word "feasible" or feasibility" in the context of flow allocation. Instead, as described above, Kondylis merely discloses reserving a bandwidth. (See Kondylis at col. 6, lines 59-67). It is the Final Office Action's contention that just because a bandwidth is reserved, then the bandwidth is also guaranteed feasible. (See Final Office Action at page 2). However, this broad interpretation directly contradicts the specification of the present application, which clearly states that a flow bandwidth allocation is only feasible when there exists a schedule that can realize them by taking into account interference relationships in the ad hoc network. (See Specification at paragraph 0062-0063).

Accordingly, Applicants respectfully submit that Kondylis fails to disclose, or suggest, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," as recited in independent claim 1. Applicants further submit that the Office Action has also failed to establish that Cousins and Galand, whether

considered individually or in combination, cure the deficiency of Kondylis.

<u>b) "*initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*"</u>

Although correctly concluding that Kondylis fails to disclose, or suggest, "*initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*," as recited in claim 1, the Final Office Action took the position that Cousins discloses the aforementioned element of claim 1. Attempting to support its conclusion, the Final Office Action interpreted "*flow sharing the link*," as reading on the single link disclosed in Cousins, and interpreted "*possible bandwidth allocation adjustment*" as reading on the network initialization process, also disclosed in Cousins. (See Final Office Action at pages 3, 8, and 10-11; See also Cousins at col. 6, lines 6-26, and at col. 7, lines 40-52). Appellants respectfully submit that the Final Office Action's interpretation of "*flow sharing the link*" and "*possible bandwidth allocation adjustment*," is not reasonable, given the specification.

Regarding "*flow sharing the link*," the specification of the present application clearly distinguishes a flow from a link. Specifically, the specification states that a transmission is made up of one or more link flows, <u>which take place simultaneously on different physical links and generally do not interfere with each other</u>. Furthermore, the specification states that <u>a physical link is commonly shared with a number of logical link</u>

flows. (See Specification at paragraph 0034). Thus, the specification clearly defines a link as a physical connection between two nodes, whereas the specification defines a flow as a logical connection between the two nodes which uses a physical link. The specification further distinguishes the term "*link*" and *flow*" by specifically stating that multiple logical flows may coexist on one physical link. Accordingly, the element "*the communication being related to possible bandwidth allocation adjustment of a flow sharing the link"* refers to adjustment of the logical connection of the two nodes, not the adjustment of the physical connection of the two nodes.

In contrast, Cousins merely discloses the bandwidth initialization of a physical connection, as opposed to a logical connection. Specifically, Cousins discloses a negotiation session between a Data Terminal Equipment and a Data Communications Equipment, where the negotiation session seeks to establish a data transfer scheme between the two machines, and specifically determines the best use of the available bandwidth for that particular physical link. (See Cousins at col. 7, lines 40-52). There is no disclosure, or suggestion, in Cousins of setting up specific configuration parameters for a logical flow which uses the physical link. Thus, there is no disclosure, or suggest, in Cousins of a possible bandwidth allocation adjustment of a flow sharing the link.

Although, the Final Office Action took the position that "*flow sharing the link*" is interpreted to read on the single link of Cousins, the Final Office Action appears to be mindful of the distinction between flow and link. In fact, the Final Office Action appeared to contradict its own argument that "*flow sharing the link*" reads on the single link of Cousins. Specifically, the Final Office Action stated that the cited passage in Cousins

indicates the different reservation of bandwidth to be made for different types of data flows, such as "isochronous data and/or other non-LAN uses such as streaming video," as recited in column 7, lines 49-52. (See Final Office Action at page 3). Thus, the Final Office Action appeared to argue for the first time that Cousins actually discloses a flow sharing a link, rather than a single link. Appellants disagree with this new position as well. In describing reserving part of the bandwidth for isochronous data, such as streaming video, Cousins still frames the discussion in terms of the physical link. Cousins discloses reserving part of the bandwidth of the physical link for isochronous data. (See Cousins at col. 7, lines 49-52). There is no disclosure, or suggestion, in Cousins of reserving a portion of the bandwidth for a particular flow which shares the link. Thus, Appellants respectfully submit that the Final Office Action's interpretation of "*flow sharing the link*," as recited in claim 1, is unreasonably broad, given the specification.

Regarding "*possible bandwidth allocation adjustment*," the Final Office Action took the position that "even though Cousins discloses setting optimized parameters prior to setting the connection, the setting of the optimized parameters are still considered 'adjustments' to be made that are adaptive to changing conditions as recited in the abstract." The Final Office Action further took the position that "the setting of optimized parameters are not necessarily adjustments to be made for existing data flows, however, they are adjustments to be made to the different flows that will be sharing the links, once the connection is set up." (See Final Office Action at page 3).

Applicants respectfully submit that this interpretation of "*adjustment*" is not reasonable given the plain meaning of the term, let alone the specification of the present

application. An initiation of a non-existent configuration parameter is not an "adjustment," as there is no pre-existing parameter to adjust. Thus, Appellants respectfully submit that the Final Office Action's interpretation of "*possible bandwidth allocation adjustment*," is also unreasonably broad, given the specification.

Furthermore, Appellants respectfully submit that Cousins does not teach or suggest a method for an "*ad hoc wireless network configured to support at least one guaranteed feasible flow allocation*," as recited in independent claim 1, and similarly recited in independent claims 6-8. Rather, Cousins is for **wired** local area (LAN) networks instead of **wireless** ad hoc networks. In wired networks, the bandwidth allocation of a particular physical link will not affect the bandwidth allocation of another physical link. In contrast, in wireless networks, the bandwidth the allocation of a particular physical link <u>can</u> affect the bandwidth allocation on another physical link. Thus, in wireless networks, the bandwidth allocation of other physical links, must be taken into consideration when adjusting the bandwidth allocation of the first physical link. Thus, one of ordinary skill in the art would readily understand that one cannot merely take the method disclosed in Cousins, which relates to wired networks, and simply apply it in a wireless network, without making modification.

In response to these arguments, which were presented in the Request for Reconsideration of July 8, 2008, the Advisory Action repeated its position that the "physical link" of Cousins includes different types of data flows sharing this single physical link. (See Advisory Action at Continuation, pages 2-3). Thus, the Advisory Action merely repeats its conclusion from the Final Office Action with respect to "*flow sharing the link*,"

without addressing Appellants' Arguments. Furthermore, the Advisory Action does not cite even a single portion of Cousins to support its conclusion that the "physical link" of Cousins includes different types of data flows.

With respect to "*adjustment*," the Advisory Action took the position that the "adjustment" is made to the different initial conditions of the network, and the communicating terminals. In other words, according to the Advisory Action, instead of having the same allocation every time the connection is set up, the system in Cousins adjusts the allocation based on the different pre-existing condition of the network. (See Advisory Action at Continuation, page 3). Appellants respectfully submit that as discussed above, the system of Cousins does not adjust the allocation based on the different conditions of the network. Instead, the system initiates the allocation based on the different conditions of the network, as there is no pre-existing allocation to adjust. Merely because the initialization of the allocation may take a different form each time due to the different conditions of the network, does not mean the initialization can be characterized as an "adjustment."

With respect to the fact that Cousins teaches a wired network, instead of a wireless network, the Advisory Action took the position that although wireless networks are more complicated than wired networks, the basic idea of bandwidth sharing is the same. Appellants respectfully submit that this position is erroneous. As discussed above, the bandwidth allocation of a particular physical link will not affect the bandwidth allocation of another physical link in a wired network; whereas, the bandwidth the allocation of a particular physical link can affect the bandwidth allocation on another physical link in a wireless network. Thus, the Advisory Action's position that it would be

obvious to one of ordinary skill in the art, at the time the invention was made, to apply the bandwidth allocation method used in a wired network to a wireless network is erroneous.

Accordingly, Applicants respectfully submit that Cousins fails to disclose or suggest, "*initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*," as recited in claim 1. Applicants further submit that the Final Office Action has also failed to establish that Galand, cures the deficiency of Kondylis and Cousins.

c) "*notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed*"

Although correctly concluding that the combination of Kondylis and Cousins fails to disclose, or suggest, "*notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed*," as recited in claim 1, the Final Office Action took the position that Galand discloses the aforementioned element of claim 1. Appellants respectfully submit that the Final Office Action's position is erroneous.

Galand discloses that a connection request is specified by the user via a set of parameters including origin and destination network address, and data flow characteristics. Galand further discloses that a bandwidth reservation process uses the connection request to reserve bandwidth on each of the links of the path, and the bandwidth reservation replies from the transit nodes and the end node generate either a

call acceptance or a call reject. Subsequently, a link metric update process, in case of a call acceptance, updates the modified link metrics by sending the information through the Control Spanning Tree to the topology database of each node in the network through a broadcast algorithm. (See Galand at col. 10, lines 59-63).

Galand fails to disclose, or suggest, a mutually-agreed upon optimal bandwidth allocation. Instead, Galand discloses that a bandwidth reservation process reserves bandwidth on each of the links of the path. Neither the user, nor any of the nodes on the links of the path, have a say in what the bandwidth allocation should be. Furthermore, Galand fails to disclose, or suggest, notifying neighbor nodes in the network. Instead, Galand discloses that all of the nodes in the network are notified of the modified link metric, through a broadcast algorithm. The use of a broadcast algorithm signifies that every node of the network receives the modified link metric. The message is not targeted to merely the neighbor nodes.

In contrast, according to embodiments of the invention, the optimal bandwidth allocation which is sent to the neighbor nodes is a mutually-agreed upon optimal bandwidth allocation. Specifically, according to embodiments of the invention, a first node (i.e. node i) initiates the rate adjustment process by sending an RT_UPD packet to a second node (i.e. node j), where the RT_UPD packet may contain a requested rate adjustment direction (e.g. increase or decrease) and amount (e.g. number of slots). Node j then responds to node i with an RT_UPD packet of its own. Then, based on the exchanged information of the RT_UPD packets, the nodes decide on the direction and the amount of the adjustment. (See Specification at paragraph 0057, steps 1-3). Thus, according to embodiments of the invention, the optimal bandwidth is a mutually-agreed

upon optimal bandwidth allocation.

Furthermore, according to embodiments of the invention, after an optimal bandwidth allocation is mutually-agreed upon by nodes A and B, both nodes A and B, and their possible affected neighbors have updated their local schedules to flow f. (See Specification at paragraph 0057, step 11). The specification further discloses that, according to embodiments of the invention, in the case of a rate increase, the adjustment of the bandwidth allocation may require adjustment of bandwidth allocation for other links adjacent to nodes A and B. Thus, according to embodiments of the invention, a notification is sent to the affected neighboring nodes. (See Specification at paragraph 0057, step 6). Thus, in embodiments of the invention, the notification is targeted toward neighbor nodes, rather than all of the nodes of the network.

In response to these arguments, which were presented in the Request for Reconsideration of July 8, 2008, the Advisory Action took the position that the claim limitation "*neighboring nodes*" does not limit the information to be passed to only the neighbor nodes, nor does the claim define the "neighbor nodes" to be only one-hop away from the "first node" or the "second node." To the first point, Appellants respectfully submit that the claim clearly recites "*notifying neighbor nodes*," and that this is not disclosed in Galand, as Galand does not distinguish between a node in the network and a neighboring node in the network. Instead, Galand merely discloses notifying all of the nodes in the network. To the second point, Appellants respectfully submit that it was never argued that the term "neighboring nodes" be limited to nodes that are only one-hop away from the "first node" or the "second node." Instead, Appellants respectfully submit that claim 1 clearly recites notifying "*neighboring nodes*." Appellants further submit that

the specification also describes notifying "*neighboring nodes.*" Thus, the present application makes a distinction between a "node" and a "neighboring node." However, there is no concept of a "neighboring node" in Galand. In fact, the term "neighboring node" is not even used in Galand. Instead, Galand merely discloses notifying <u>all</u> nodes.

The Advisory Action further took the position that the claim limitation "*mutually-agreed upon*" does not require any user or nodes on the path to have a say on the bandwidth allocation. Instead, according to the Advisory Action, the claim only requires the allocation to be "mutually agreed upon," or accepted by the associated nodes. (See Advisory Action at Continuation, page 4). Appellants respectfully submit that the limitation in full, as recited in claim 1, is "*mutually-agreed upon optimal bandwidth allocation*." Thus, it is the optimal bandwidth allocation which must be mutually-agreed upon. Appellants respectfully submit that the mere acceptance by the associated nodes does not meet the limitation of "*mutually-agreed upon optimal bandwidth allocation*" as recited in claim 1, as the fact that the user has agreed to the connection does not necessarily mean that the user agrees that the bandwidth allocation is optimal. Furthermore, assuming *arguendo* that the mere acceptance of the connection by the associate nodes would meet the aforementioned limitation, the Advisory Action's position is still erroneous, as Galand does not disclose the associated nodes accepting the connection request to reserve bandwidth. Instead, the associated nodes merely reply to the bandwidth reservation process, and the bandwidth reservation, on its own, generates either a call acceptance or a call reject. (See Galand at col. 10, lines 50-58).

d) One of Ordinary Skill in the Art Would Not Be Motivated to Combine the References of Kondylis, Cousins, and Galand.

Finally, even assuming *arguendo* that the combination of Kondylis, Cousins, and Galand disclosed all the elements of claim 1, Appellants submit that one of ordinary skill in the art would not be motivated to combine the references of Kondylis, Cousins, and Galand, as either Cousins or Garland would render Kondylis inoperable for its intended purpose.

The Final Office Action took the position that it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the system of Kondylis by using the features, as taught by Cousins and Galland, in order to provide efficient use of bandwidth between two nodes, and in order to provide intermediate nodes with essential information regarding bandwidths to be allocated to the particular link. (See Final Office Action at page 16). The Final Office Action further took the position that "[a]lthough, Cousins and Galand are more concerned with wired local networks than wireless local networks, it would still be obvious for one of the ordinary skill in the art at the time of the invention to modify a wireless ad-hoc network, as taught in Kondylis's invention, using features as taught by Cousins and Galand, in order to solidify the bandwidth sharing implementation. ... Although the implementation of a wireless network is more complicated due to wireless link interference, the idea of managing available bandwidth resource [sic] is still the same." (See Final Office Action at pages 2-3). Appellants respectfully submit that both of these positions are erroneous.

As reiterated by the Supreme Court , the framework for the objective analysis for determining obviousness under 35 U.S.C. § 103 is stated in *Graham v. John Deere Co.*,

383 U.S. 1, 148 USPQ 459 (1966). Obviousness is a question of law based on underlying factual inquiries. The factual inquiries are: (a) determining the scope and content of the prior art; (b) ascertaining the differences between the claimed invention and the prior art; and (c) resolving the level of ordinary skill in the pertinent art. *See KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, 82 USPQ2d 1385 (2007); *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). The Supreme Court has also stated that "rejections on obviousness cannot be sustained by mere conclusory statements; instead there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR*, 550 U.S. ___, 82 USPQ2d 1385 (2007).

Kondylis is directed to a **wireless** ad-hoc network, where, in contrast, Cousins is configured for a **wired** local area (LAN) network. The configurations of Kondylis and Cousins have different configurations and applications, such that, a person of ordinary skill in the art would not be motivated to combine both references as one reference would render the other inoperable for its intended purpose. Therefore, a combination of Kondylis and Cousins is improper.

Referring to Galand, this reference generally describes routing path selection and bandwidth reservation to connections sharing a path in a packet switched ***wireline*** communication network. Galand further provides exchanging of information (109) between the origin (access) node (100), the transit nodes (107) on the path, and the destination node (108). A Bandwidth Reservation (104) replies from transit nodes and end node generate either a call acceptance or a call reject (110). A Link Metric Update

process (105) updates, in case of call acceptance, the modified link metrics. This information (111) is sent through the Control Spanning Tree to the Topology Database of each node in the network by means of a broadcast algorithm.

In contrast, claim 1 recites, in part, "[a] *method of allocating bandwidth in a first node that is operable in* ***an ad hoc, wireless network*** *configured to support at least one guaranteed feasible flow allocation...comprising...initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*." In contrast, Galand refers to connections sharing **wireline** paths. In the present application, the bandwidth allocation of a flow on one link of a wireless node depends on the bandwidth allocations of flows on other adjacent links of this node. In Galand's wireline case, each link is an independent resource for connections sharing it. Furthermore, for similar reasons as those previously provided for Cousins, a person of ordinary skill in the art would not have been motivated to combine the teachings of Galand with that of Kondylis as the first reference refers to wireline paths where Kondylis refers to wireless network.

Instead of any articulated reasoning, with a rational underpinning, the Final Office Action merely makes the conclusory statement that the idea of managing available bandwidth resource is the same for wired networks and wireless networks. The Office Action fails to provide any concrete or convincing arguments as to how exactly the cited references of Cousins and Galand can be incorporated to Kondylis and yield the present application. Specifically, the Final Office Action does not provide any concrete or specific

way to adapt the single-link wired network approach of Cousins and Galand to multi-link wireless ad hoc networks.

Furthermore, Appellants respectfully disagree with the Final Office Action's assertion that the idea of managing available bandwidth is the same for wired networks and wireless networks. Applicants respectfully submit that one of ordinary skill in the art would readily understand that resource allocation in wired networks is very different than resource allocation in wireless ad hoc networks, and different mechanisms are needed to realize it.

In response to these arguments, which were presented in the Request for Reconsideration of July 8, 2008, the Advisory Action took the position that the claims do not include any limitations on the use of different mechanism. According to the Advisory Action, the claim simply requires the idea of the negotiation of bandwidth allocation between the nodes in communication, and that this idea is the same for any communication network requiring bandwidth allocation. (See Advisory Action at Continuation, page 5). Appellants respectfully submit that the Advisory Action's analysis improperly distills the invention down to a "gist" or "thrust" of an invention, and disregards the requirement of analyzing the subject matter "as a whole." *See W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). Thus, the Advisory Action's rationale cannot support a finding of obviousness.

As the Office Action's analysis fails to comply with the framework articulated in *Graham*, Appellants respectfully submit that the Final Office Action has failed to establish

a prima facie case of obviousness. Accordingly, it is respectfully requested that this rejection be reversed and the claim allowed.

2) Claim 2

Claim 2 is dependent on claim 1, and recites further limitations. Thus, claim 2 is patentable at least for the reasons claim 1 is patentable, and further, because it recites additional limitations.

Specifically, claim 2 also recites *"re-performing the initiating, determining, communicating, notifying, and adopting steps at a later point in time."* The Final Office Action took the position that col. 6, lines 19-26 of Cousins discloses the aforementioned limitation of claim 2. However, the cited portion of Cousins merely discloses during a period of idleness, a network initiation process may continue in the form of an <u>ongoing calibration</u> to gather measurements and statistics to optimize communication over the link. (See Cousins at col. 6, lines 19-26). Thus, even assuming *arguendo* that the network initialization process of Cousins, disclosed the initiating, determining, communication, notifying, and adopting steps, the cited portion of Cousins fails to disclose re-performing the network initialization process; instead, the cited portion merely discloses continuing the <u>calibration</u> associated with the network initialization process. Thus, Cousins fails to disclose, or suggest, *"re-performing the initiating, determining, communicating, notifying, and adopting steps at a later point in time,"* as recited in claim 2. Furthermore, the Final Office Action failed to establish that Kondylis or Galand cures the deficiency of Cousins. Accordingly, Appellants respectfully submit that the Final

Office Action has failed to establish a prima facie case of obviousness, as claim 2 would not have been obvious to one of ordinary skill of the art, at the time the invention was made, in light of the cited references of Kondylis, Cousins, and Galand.

3) Claim 4

Claim 4 is dependent on claim 1, and recites further limitations. Thus, claim 4 is patentable at least for the reasons claim 1 is patentable, and further, because it recites additional limitations.

4) Claim 5

Claim 5 is dependent on claim 1, and recites further limitations. Thus, claim 5 is patentable at least for the reasons claim 1 is patentable, and further, because it recites additional limitations.

5) Claim 6

Claim 6 recites a network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The device includes a first communication unit configured to initiate a communication between the device and a node in the network that, together, are endpoints of a link in the network, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link, and a first processing unit configured to determine a first new bandwidth allocation that approaches a first optimization condition for the flow, wherein the first processing unit is operably connected to the first communication unit. The device

further includes a second communication unit configured to communicate with the node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, wherein the second communication unit is operably connected to the first communication unit, and a third communication unit configured to notify neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed, wherein the third communication unit is operably connected to the first communication unit. The device further includes a second processing unit configured to adopt the mutually-agreed upon optimal allocation for the flow when reallocation is needed, wherein the second processing unit is operably connected to the first communication unit.

Appellants respectfully submit that Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, all of the elements of claim 6.

Kondylis, Cousins, and Galand are discussed above. The Final Office Action took the position that Kondylis discloses all the elements of claim 6, with the exception of "a first communication unit configured to initiate a communication between the device and a node in the network that, together, are endpoints of a link in the network, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link," "a first processing unit configured to determine a first new bandwidth allocation that approaches a first optimization condition for the flow, wherein the first processing unit is operably connected to the first communication unit," "a second communication unit configured to communicate with the node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, wherein the second communication unit is operably connected to the first communication unit," "a third

communication unit configured to notify neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed, wherein the third communication unit is operably connected to the first communication unit;" and "a second processing unit configured to adopt the mutually-agreed upon optimal allocation for the flow when reallocation is needed, wherein the second processing unit is operably connected to the first communication unit." The Final Office Action then cited Cousins and Galand as allegedly curing the deficiencies of Kondylis. (See Final Office Action at pages 6-9, 11-12, and 15).

Appellants respectfully submit that the rejection is erroneous. Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, at least, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," "*a first communication unit configured to initiate a communication between the device and a node in the network that, together, are endpoints of a link in the network, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*," and "*a third communication unit configured to notify neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed, wherein the third communication unit is operably connected to the first communication unit*," as recited in claim 6. Specifically, the combination of Kondylis, Cousins, and Galand fails to disclose, or suggest, the aforementioned elements of claim 6 for similar reasons as to why the combination of Kondylis, Cousins, and Galand fails to disclose, or suggest, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," "*initiating a*

communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link," and "*notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed*," as recited in claim 1, as discussed above in Section VII. A. 1.

Furthermore, even assuming *arguendo* that the combination of Kondylis, Cousins, and Galand disclosed all the elements of claim 6, Appellants submit that one of ordinary skill in the art would not be motivated to combine the references of Kondylis, Cousins, and Galand, for similar reasons as discussed above, with respect to claim 1. Accordingly, Appellants respectfully submit that the Final Office Action has failed to establish a prima facie case of obviousness, as claim 6 would not have been obvious to one of ordinary skill of the art, at the time the invention was made, in light of the cited references of Kondylis, Cousins, and Galand.

6) Claim 7

Claim 7 recites a computer program embodied on a computer readable medium to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The computer program is configured to control a processor to perform a first sub-routine for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link, and a second sub-routine for determining, in the first node, a first new

bandwidth allocation that approaches a first optimization condition for the flow. The computer program is further configured to control the processor to perform a third sub-routine for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, and a fourth sub-routine for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. The computer program is further configured to control a processor to perform a fifth sub-routine for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed.

Appellants respectfully submit that Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, all of the elements of claim 7.

Kondylis, Cousins, and Galand are discussed above. The Final Office Action took the position that Kondylis discloses all the elements of claim 7, with the exception of "a first sub-routine for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link," "a second sub-routine for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow," "a third sub-routine for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow," "a fourth sub-routine for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed," and "a fifth sub-routine for adopting the mutually-agreed upon optimal allocation for the flow when the reallocation is needed." The Final Office Action then cited Cousins

and Galand as allegedly curing the deficiencies of Kondylis. (See Final Office Action at pages 7-9 and 13).

Appellants respectfully submit that the rejection is erroneous. Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, at least, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," "*a first sub-routine for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*," and "*a fourth sub-routine for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed*," as recited in claim 7. Specifically, the combination of Kondylis, Cousins, and Galand fails to disclose, or suggest, the aforementioned elements of claim 7 for similar reasons as to why the combination of Kondylis, Cousins, and Galand fails to disclose, or suggest, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," "*initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*," and "*notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed*," as recited in claim 1, as discussed above in Section VII. A. 1.

Furthermore, even assuming *arguendo* that the combination of Kondylis, Cousins, and Galand disclosed all the elements of claim 7, Appellants submit that one of ordinary

skill in the art would not be motivated to combine the references of Kondylis, Cousins, and Galand, for similar reasons as discussed above, with respect to claim 1. Accordingly, Appellants respectfully submit that the Final Office Action has failed to establish a prima facie case of obviousness, as claim 7 would not have been obvious to one of ordinary skill of the art, at the time the invention was made, in light of the cited references of Kondylis, Cousins, and Galand.

7) Claim 8

Claim 8 recites a network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The device includes initiation means for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link, and determination means for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. The device further includes determination means for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, and notification means for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. The device further includes adoption means for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed.

Appellants respectfully submit that Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, all of the elements

of claim 8.

Kondylis, Cousins, and Galand are discussed above. The Final Office Action took the position that Kondylis discloses all the elements of claim 8, with the exception of "initiation means for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link," "determination means for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow," "determination means for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow," "notification means for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed," and "adoption means for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed." The Final Office Action then cited Cousins and Galand as allegedly curing the deficiencies of Kondylis. (See Final Office Action at pages 7, 9, and 14-15).

Appellants respectfully submit that the rejection is erroneous. Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, or suggest, at least, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation*," "*initiation means for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link*," and "*notification means for notifying neighbor nodes in the network*

of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed," as recited in claim 8. Specifically, the combination of Kondylis, Cousins, and Galand fails to disclose, or suggest, the aforementioned elements of claim 8 for similar reasons as to why the combination of Kondylis, Cousins, and Galand fails to disclose, or suggest, "*an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation,*" "*initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link,*" and "*notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed,*" as recited in claim 1, as discussed above in Section VII. A. 1.

Furthermore, even assuming *arguendo* that the combination of Kondylis, Cousins, and Galand disclosed all the elements of claim 8, Appellants submit that one of ordinary skill in the art would not be motivated to combine the references of Kondylis, Cousins, and Galand, for similar reasons as discussed above, with respect to claim 1. Accordingly, Appellants respectfully submit that the Final Office Action has failed to establish a prima facie case of obviousness, as claim 8 would not have been obvious to one of ordinary skill of the art, at the time the invention was made, in light of the cited references of Kondylis, Cousins, and Galand.

B. Claim 3 is not obvious in view of Kondylis, Cousins, Galand, and Counterman

In the Final Office Action, claim 3 was rejected under 35 U.S.C. § 103(a) as being

unpatentable over Kondylis, Cousins, Galand, and Counterman. Appellants submit that claim 3 recites subject matter that is not obvious in light of Kondylis, Cousins, Galand, and Counterman, and such, the Board's reversal of the rejection is respectfully requested.

Claim 3 is dependent on claim 1, and recites further limitations. As the Final Office Action has failed to establish that Counterman cures the deficiencies of Kondylis, Cousins, and Galand, identified above, claim 3 is patentable at least for the reasons claim 1 is patentable, and further, because it recites additional limitations.

Furthermore, Appellants respectfully submit that Kondylis, Cousins, Galand, and Counterman, whether considered individually or in combination, fail to disclose, or suggest, all of the elements of claim 3.

Kondylis, Cousins, and Galand are discussed above. Counterman generally describes a method and apparatus for a communications system that prioritizes packets that are transmitted over a digital communication channel utilizing at least one error-correcting transmission path associated with a Quality of Service (QoS) objective. The QoS objective is used to select the appropriate transmission path (that may include forward error coding, scrambling, and interleaving) that satisfies the relevant metrics of the desired level of service quality such as packet latency, variation of the packet latency, information throughput, and packet error rate (PER). The communications system selects a transmission path that is associated with QoS objectives best matched to the QoS objectives as required by the originating application. (see Counterman at Abstract).

The Final Office Action took the position that the combination of Kondylis, Cousins, and Galand discloses all the elements of claim 3, with the exception of

"determining, in a first node, a first new bandwidth allocation that approaches at least one of a Max Min Fair condition and a Quality of Service guarantee condition." The Final Office Action then cited Counterman as allegedly curing the deficiencies of Kondylis, Cousins, and Galand. (See Final Office Action at page 16). Appellants respectfully submit that the rejection is erroneous because Counterman fails to disclose, or suggest, at least, "*determining, in the first node, the first new bandwidth allocation that approaches at least one of a Max Min Fair condition and a Quality of Service guarantee condition*," as recited in claim 3.

The cited portion of Counterman merely discloses that a communications system manages, monitors, and prioritizes packets and allocates bandwidth with a packet network in order to satisfy the QoS objectives associated with the originating application. (See Counterman at col. 1, lines 63-66). Appellants respectfully submit that this disclosure is merely a statement of an intended objective and does not enable one of ordinary skill in the art how to determine if a new bandwidth allocation approaches a Quality of Service guarantee condition. In other words, one of ordinary skill in the art would readily understand that are several systems for which one can allocate bandwidth to realize a QoS guarantee condition, but a method for achieving the condition differs from system to system. Furthermore, Applicants respectfully submit that embodiments of the invention, may not only realize QoS objectively, but also may realize fairness objectives in wireless ad hoc networks, a concept not disclosed in Counterman.

C. Claim 7 is patentable under 35 U.S.C. § 101

The Final Office Action rejected claim 7 under 35 U.S.C. §101 as allegedly being

directed to non-statutory subject matter. Specifically, the Final Office Action indicated that claim 7 claims a computer program, and alleged that a computer program is not a physical object, and therefore is non-statutory. In contrast, the Final Office Action alleged, a physical computer readable medium is statutory since it is a physical object. The Final Office Action further suggested that the claim should read "a computer readable medium encoded with a computer program, which when executed performs..." The Final Office Action distinguished between a physical computer readable medium and a software program, stating that because a computer readable medium is a physical object, it is statutory, and because a software program is not a physical object, it is non-statutory. (see Final Office Action at page 4). Appellants respectfully submit that this rejection is erroneous for at least the following reasons.

Claim 7 recites "[*a*] *computer program* *<u>embodied on a computer readable medium</u>* ... *the computer program being configured* *<u>to control a processor</u>*...." Thus, contrary to the Final Office Action's position, claim 7 is not directed toward a computer program; instead, it is directed toward a computer program <u>embodied on a computer readable medium</u>. In rejecting claim 7, the Final Office Action appears to be emphasizing form over substance. Specifically, the Final Office Action appears to be taking the position that "computer readable medium encoded with a computer program," is statutory, where "computer program embodied on a computer readable medium," is somehow non-statutory, even though both phrases are directed toward the same concept: functional descriptive material tangibly embodied on a computer readable medium. Appellants respectfully submit that the Final Office Action's emphasis on form over substance is not supported by U.S. patent law, or United States Patent and Trademark

Office procedure, under the MPEP.

MPEP § 2106.01 defines "functional descriptive material" as "data structures and computer programs which impart functionality when employed as a computer component." Furthermore, MPEP § 2106 states that "when functional descriptive material is recorded on some computer-readable medium, it becomes structurally and functionally interrelated to the medium and will be statutory...." See MPEP § 2106.01 – Computer-Related Nonstatuory Subject Matter. It is important to note that the MPEP does not require a specific format for a claim directed toward a computer program recorded on a computer readable medium. Instead, the MPEP merely require that the claim be directed toward a computer element which defines a structural and functional interrelationship between the computer program and the rest of the computer which permit the computer program's functionality to be realized, as opposed to being directed towards a computer listing per se. Appellants respectfully submit that "*a computer program embodied on a computer readable medium ... the computer program being configured to control a processor to perform*," as recited in claim 7 identifies the required structural and functional interrelationship between the computer program and the rest of the computer, to distinguish the claim from a computer program per se. Thus, claim 7 recites patentable subject matter. Accordingly, Appellants respectfully request that the rejection be reversed.

For all of the above noted reasons, it is strongly contended that certain clear differences exist between the present invention as claimed in claims 1-8 and the prior art relied upon by the Examiner. It is further contended that these differences are more than

sufficient that the present invention would not have been obvious to a person having ordinary skill in the art at the time the invention was made. Finally it is contended that claims 1-8 recite patentable subject matter.

This final rejection being in error, therefore, it is respectfully requested that this honorable Board of Patent Appeals and Interferences reverse the Examiner's decision in this case and indicate the allowability of application claims 1-8.

In the event that this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees which may be due with respect to this paper may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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Encls: Appendix 1 - Claims on Appeal
Appendix 2 - Evidence
Appendix 3 - Related Proceedings

APPENDIX 1

CLAIMS ON APPEAL

1. (Original) A method of allocating bandwidth in a first node that is operable in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation, the method comprising the steps of:

initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link;

determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow;

communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow;

notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed; and

adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed.

2. (Original) The method of claim 1, further comprising the step of:

re-performing the initiating, determining, communicating, notifying, and adopting steps at a later point in time.

3. (Previously Presented) The method of claim 1 wherein the determining

step comprises determining, in the first node, the first new bandwidth allocation that approaches at least one of a Max Min Fair condition and a Quality of Service guarantee condition.

4. (Original) The method of claim 1, wherein the initiating step comprises initiating a communication between the first node and the second node in a slotted, ad hoc, wireless network.

5. (Original) The method of claim 1, wherein the initiating step comprises initiating a communication between the first node and the second node in a network on which a Time Division Multiple Access (TDMA) schedule is implemented.

6. (Original) A network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation, the device comprising:

a first communication unit configured to initiate a communication between the device and a node in the network that, together, are endpoints of a link in the network, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link;

a first processing unit configured to determine a first new bandwidth allocation that approaches a first optimization condition for the flow, wherein the first processing unit is operably connected to the first communication unit;

a second communication unit configured to communicate with the node to

determine a mutually-agreed upon optimal bandwidth allocation for the flow, wherein the second communication unit is operably connected to the first communication unit;

a third communication unit configured to notify neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed, wherein the third communication unit is operably connected to the first communication unit; and

a second processing unit configured to adopt the mutually-agreed upon optimal allocation for the flow when reallocation is needed, wherein the second processing unit is operably connected to the first communication unit.

7. (Previously Presented) A computer program embodied on a computer readable medium to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation, the computer program being configured to control a processor to perform:

a first sub-routine for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link;

a second sub-routine for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow;

a third sub-routine for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow;

a fourth sub-routine for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed; and

a fifth sub-routine for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed.

8. (Original) A network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation, the device comprising:

initiation means for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link;

determination means for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow;

determination means for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow;

notification means for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed; and

adoption means for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed.

APPENDIX 2

EVIDENCE APPENDIX

No evidence under section 37 C.F.R. 1.130, 1.131, or 1.132 has been entered or will be relied upon by Appellants in this appeal.

APPENDIX 3

RELATED PROCEEDINGS APPENDIX

No decisions of the Board or of any court have been identified under 37 C.F.R. §41.37(c)(1)(ii).